

Appl. No. 10/602,123
Arndt. Dated November 30, 2005
Reply to Office Action of June 7, 2005

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1-12 (canceled)

13. (original) An apparatus for processing a waste product comprising:

a rotatable drum having an inlet end and an outlet end with said inlet end attached to an inlet bulkhead by a first seal and said outlet end attached to an outlet bulkhead by a second seal; said drum configured such that a material placed in said drum via an opening in said inlet bulkhead flows from said drum via an outlet opening in said outlet bulkhead; and wherein said seals separate the inside of said drum from the outside; and

an enclosure disposed about said drum having an inlet end with an enclosure inlet opening and an outlet end with an enclosure outlet opening for circulating hot gas over the outside of said drum to heat the material in said drum;

a plasma reactor connected to said drum outlet bulkhead opening for receiving and processing said waste material from said drum; said reactor having a gas removal opening connected to said drum enclosure inlet opening for removing the gas created by said reactor, and at least one other opening for removing molten material from said reactor; and

a recirculation blower, having a blower inlet connected to said drum enclosure outlet opening and a blower outlet connected to said gas removal opening of said plasma reactor for blending said created reactor gas with the gas circulated around said drum.

14. (original) The apparatus of Claim 13 including a cyclone connected to said gas removal opening to remove solids from said created gas.

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15. (original) The apparatus of Claim 13 including a venturi exhauster having a driving fluid inlet connected to said blower outlet, a feed inlet connected to said gas removal opening and an exhauster outlet connected to said enclosure inlet to assist in drawing said reactor gas from said reactor and blending said reactor gas with said circulated gas.

16. (original) The apparatus of Claim 13 including a controllable source of cooling and/or reforming medium suitably connected to said reactor.

17. (original) An apparatus for processing a waste product comprising:

a rotatable drum having an inlet end and an outlet end with said inlet end attached to an inlet bulkhead by a first seal and said outlet end attached to an outlet bulkhead by a second seal; said inlet bulkhead having a waste inlet opening for flowing said waste product to the inside of said drum and a vapor outlet opening for removing gas from said drum, and said outlet bulkhead having a solids outlet opening for removing the solid material in said drum and a hot gas inlet opening for receiving a hot gas; said drum being configured such that the solid waste material flowing through said waste inlet opening flows from the inlet end of said drum to said solids outlet opening and such that hot gas flowing through said hot gas inlet opening flows through said drum to heat said waste in said drum, and flows out said gas outlet opening; said seals separating the inside of said drum from the outside;

a plasma reactor connected to said solids outlet opening for receiving and processing said solid material from said drum; said reactor having a gas removal opening connected to said hot gas inlet opening for removing the gas created by said reactor, and at least one other opening for removing the molten material from said reactor;

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a conduit connected to said vapor outlet opening in said inlet bulkhead for receiving said hot gas from said reactor and the vapors created from said waste and conducting them out of said drum.

18. (original) The apparatus of Claim 17 wherein the outlet of said conduit flows through a venturi scrubber connected to said conduit for scrubbing said hot gas and vapors, and wherein the outlet of said scrubber is connected to a container for collecting the liquids and gasses from said scrubber, and wherein a pump is connected to said container for removing and recirculating liquids in said container to a driving fluid inlet in said Venturi scrubber.

19. (original) The apparatus of Claim 17 including a controllable source of cooling and/or reforming medium suitably connected to said reactor.

20. (original) The apparatus of Claim 18 including an air cooler connected between the outlet of said pump and said Venturi scrubber for cooling said re-circulated liquid.

21. (original) The apparatus of Claim 19 including a demister element in said container for removing free liquid droplets from said gasses.

22. (currently amended) The apparatus of Claim 19 including a controllable stream outlet in said container, connected to a centrifuge, for removing a side stream of said liquid and separating said side stream into solids, oil and water; said centrifuge having a controllable water line connected to said container for maintaining a desired level in said container.

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23. (original) The apparatus of Claim 17 including means to supply additional external heat to said drum.

24. (original) An apparatus for processing a waste product comprising:

a rotatable drum having an inlet end and an outlet end with said inlet end attached to an inlet bulkhead by a first seal and said outlet end attached to an outlet bulkhead by a second seal; said inlet bulkhead having a waste inlet opening for flowing said waste product to the inside of said drum and a gas outlet opening for removing gas from said drum, and said outlet bulkhead having a solids outlet opening for removing the solid material in said drum and a hot gas inlet opening for receiving a hot gas; said drum being configured such that the solid waste material flowing through said waste inlet opening flows from the inlet end of said drum to said solids outlet opening and hot gas flowing through said hot gas inlet opening flows through said drum to heat said waste in said drum and flows out said gas outlet opening in said inlet bulkhead; said seals separating the inside of said drum from the outside;

a first plasma reactor connected to said solids outlet opening for receiving and processing said solid material from said drum; said reactor having a first gas removal opening connected to said hot gas inlet opening of said drum outlet bulkhead for removing the gas created by said first reactor, and at least one other opening for removing the molten material from said first reactor;

a second plasma reactor, having a first conduit connected to said gas outlet opening of said inlet bulkhead, for receiving and processing said gasses from said outlet opening; said second reactor having a second gas removal opening and at least one other opening for removing the molten material from said second reactor;

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a second conduit, connected to said second reactor gas outlet opening for receiving said hot gas from said reactor.

25. (original) The apparatus of Claim 24 wherein said second conduit includes a cyclone for removing solids in the hot gas flowing through said conduit.

26. (original) The apparatus of Claim 24 including a controllable source of cooling and/or reforming medium suitably connected to said first and second reactors.

27. (original) The apparatus of Claim 24 including a cross exchanger positioned in said first and second conduit to heat said drum gas from said drum and cool said hot gas from said cyclone.

28. (original) An apparatus for processing a waste product comprising:

a rotatable drum having an inlet end and an outlet end with said inlet end attached to an inlet bulkhead by a first seal and said outlet end attached to an outlet bulkhead by a second seal; said drum configured such that a material placed through an opening in said inlet bulkhead flows from the inlet through a solids outlet opening in said outlet bulkhead and the vapors and gasses created in said drum flow out a gas outlet opening in said inlet bulkhead; said seals separating the inside of said drum from the outside;

an enclosure disposed about said drum having an inlet end with an enclosure inlet opening and an outlet end with an enclosure outlet opening for circulating hot gas over the outside of said drum to heat the material in said drum;

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a plasma reactor connected to said solids outlet opening for receiving and processing the solid waste material from said drum; said reactor having a gas removal opening connected to said drum enclosure inlet opening for removing the reactor gas created by said reactor, and at least one other opening for removing molten material from said reactor;

a recirculation blower having a blower inlet connected to said drum enclosure outlet opening and a blower outlet connected to said gas removal opening of said reactor for blending said created gas with the gas circulated around said drum; and a first conduit connected between said blower and said drum enclosure for selectively removing said circulated gas from said apparatus;

a second conduit connected to said gas outlet opening in said inlet bulkhead for collecting said vapors and gasses from in said drum.

29. (original) The apparatus of Claim 28 including a cyclone suitably positioned in the line of said reactor gas removal opening to remove solids in said reactor gas.

30. (original) The apparatus of Claim 29 including a venturi exhauster having a driving fluid inlet connected to said blower outlet, a feed inlet connected to the outlet of said cyclone and an exhauster outlet connected to said enclosure inlet.

31. (original) The apparatus of Claim 28 including a controllable source of cooling and/or reforming medium suitably connected to said reactor.

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32. (original) The apparatus of Claim 28 including a venturi scrubber connected to said conduit, for scrubbing said hot gas and vapors, having a container connected to the outlet of said scrubber, for collecting the liquids and gasses from said scrubber, and a pump, connected to said container, for removing and recirculating said container liquid to a driving fluid inlet in said Venturi scrubber; said container having a gas outlet for removing the gasses collected in said container.

33. (original) The apparatus of Claim 31 including a demister element in said gas outlet of said container for removing free liquid droplets from said gasses.

34. (original) The apparatus of Claim 31 including an air cooler connected between the outlet of said pump and said Venturi scrubber for cooling said re-circulated liquid.

35. (original) The apparatus of Claim 31 including a controllable liquid outlet in said container for selectively removing the liquid collected in said container.

36. (original) The apparatus of Claim 31 including a controllable liquid supply line for maintaining a selected liquid level in said container.

37. (original) An apparatus for processing a waste product comprising:
a rotatable drum having an inlet end and an outlet end with said inlet end attached to an inlet bulkhead by a first seal and said outlet end attached to an outlet bulkhead by a second seal; said drum configured such that a material placed in said drum via an opening in said inlet bulkhead

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flows from said drum via a solids outlet opening in said outlet bulkhead and the drum gasses created in said drum flow out of said drum via a gas outlet opening in said inlet bulkhead; said seals separating the inside of said drum from the outside;

an enclosure disposed about said drum having an inlet end with an enclosure inlet opening and an outlet end with an enclosure outlet opening for circulating hot gas over the outside of said drum to heat the material in said drum;

a first plasma reactor connected to said solids outlet opening for receiving and processing the solid waste material from said drum; said reactor having at least a first opening for removing molten material from said reactor; and having a second opening connected to a first conduit for removing the reactor gas created by said first reactor;

a second plasma reactor having a second conduit connected to said gas outlet opening for receiving and processing said drum gasses from said drum; said second reactor having a third gas removal opening connected by a third conduit to said enclosure inlet opening for removing the hot gas created by said second reactor, and having at least a fourth opening for removing the molten material from said second reactor;

a recirculation blower, having a blower inlet connected to said drum enclosure outlet opening and a blower outlet connected to said third conduit for blending gas created in said second reactor with the gas circulated over said drum;

a fourth conduit connected between said blower and said drum enclosure for selectively removing said circulated gas from said apparatus.

38. (original) The apparatus of Claim 37 including a cyclone positioned in said first conduit to remove solids from said reactor gas.

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39. (original) The apparatus of Claim 37 including a cyclone positioned in said third conduit to remove solids from said second reactor gas.

40. (original) The apparatus of Claim 38 including a venturi exhauster having a driving fluid inlet connected to said blower outlet, a feed inlet connected to the outlet of said cyclone, and an exhauster outlet connected to said drum enclosure inlet.

41. (currently amended) The apparatus of Claim 37 including a controllable source of cooling and/or reforming medium suitably connected to said first and second reactors.

42. (currently amended) The apparatus of Claim 37 including a cross exchanger positioned in said first and second conduits to heat said drum gas from said drum and cool said first reactor gas.

43-48. (canceled)